WORK-RELATED BURN SURVEILLANCE IN UTAH, 1998

May 25, 2000
Environmental Epidemiology Program
Bureau of Epidemiology
Utah Department of Health

EXECUTIVE SUMMARY

In Utah, 15,325 work-related burns (thermal and chemical) were reported to the Industrial Accident Division of the Utah Labor Commission between 1992 through 1997. Approximately 13 percent of all serious burns requiring hospitalization between 1992 through 1997 were work-related. Work-related burns are the leading cause of injury in the United States. Approximately 1.4 million persons in the United States sustain burns each year, of which approximately 54,000 to 84,000 are hospitalized.

In October of 1997, the Environmental Epidemiology Program (EEP) established a registry of work-related burn cases in Utah. This project is funded by a grant from the Centers of Disease Control and Prevention (CDC) and National Institute for Occupational Safety and Health (NIOSH). The Environmental Epidemiology Program continues to maintain the registry of work-related burn cases in Utah, and uses the information from cases to develop and implement intervention activities, help ensure that affected workers are identified and receive the appropriate medical and environmental follow-up, and ensure that appropriate prevention activities are directed toward targeted industries.

Hospital discharge data was received by the Utah Department of Health's, Bureau of Epidemiology under the authority of the Utah Injury Reporting Rule (R386-703). The Injury Reporting Rule requires that injuries be reported by hospitals to the Bureau of Epidemiology. Patient records containing one or more International Codes of Diagnosis, 9th Revision, Clinical Methods, (ICD-9) codes attributed to burns were then evaluated to determine if the burn injury was work-related.

The EEP examined the incidence of hospital admissions attributed to work-related burns that occurred in the state of Utah in 1998. During 1998, hospitals throughout Utah reported 270 hospital admissions that were attributed to burns. Of these reported burn-related injuries, 57 cases were work-related and 213 were non-work-related. The incidence of work-related burns in Utah for 1998 is 5.2 (Male: 9.1; Female 1.8). Incidence rates (crude) were calculated *per 100,000 population* and are based on Utah's 1998 total workforce population.

The incidence for work-related burns is significantly higher among males than females, and relative to age groups, persons 20 - 24 years of age demonstrated the highest incidence of work-related burn injuries. Salt Lake County accounted for 44 percent of the total workforce population and was the largest contributor to work-related burn injuries accounting for just over 60% of the burns. Monday and Saturday are the days most likely for a work-related injury to occur, and December is the most likely month for an injury. Eating places accounted for most of the work-related burns, and college graduates were less likely to be burned on the job than non-college graduates.

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INTRODUCTION

In Utah, 15,325 work-related burns (thermal and chemical) were reported to the Industrial Accident Division of the Utah Labor Commission between 1992 through 1997 (LCU, 1994-97). Approximately 13 percent of all serious burns requiring hospitalization between 1992 through 1997 were work-related. Work-related burns are the leading cause of injury in the United States (CDC, 1993). Approximately 1.4 million persons in the United States sustain burns each year, of which approximately 54,000 to 84,000 are hospitalized.

In October of 1997, the Environmental Epidemiology Program (EEP) established a registry of work-related burn cases in Utah. This project is funded by a grant from the Centers of Disease Control and Prevention (CDC) and National Institute for Occupational Safety and Health (NIOSH). The EEP maintains the registry of work-related burn cases in Utah, and uses the information from cases to develop and implement intervention activities. Interventions include education and consultation to employers where burn hazards are present, education for cases and workers, broader industry-wide studies, and research.

METHODS

Hospital discharge data was received from hospitals by the Utah Department of Health's, Bureau of Epidemiology under the authority of the Utah Injury Reporting Rule (R386-703). The Injury Reporting Rule requires that injuries be reported by hospitals to the Bureau of Epidemiology. Patient records containing one or more International Codes of Diagnosis, 9th Revision, Clinical Methods, (ICD-9) codes attributed to burns were then evaluated to determine if the burn injury was work- related. Medical records of each work-related case were abstracted to gather risk factor information such as personal identifiers, days hospitalized, employer, insurance, severity, and cause of injury regarding the work-related injury. The work-related burn injury data was then entered into the work-related Burn Injury Registry using EpiInfo 6.0 software.

Death certificates were searched by the Utah Department of Health's Bureau of Vital Records for certificates that list work-related burn injuries as a contributing or underlying cause of death (UDOH, 1998).

Extraction of tabular data for all burns by county, age group and gender was performed using the EpiInfo 6.0 software. All rates presented are crude rates calculated *per 100,000 population* unless otherwise specified and are based on Utah's 1998 workforce population. Analysis of incidence rates was performed using Corel Quattro Pro 8. Workforce population estimates for age groups and gender for 1998 were obtained from the Utah Department of Workforce Services, Division of Workforce Information and Payment Services (UDOWS, 1998).

Surveys were mailed to those cases identified as work-related to obtain more detailed risk

factor and demographic information. Survey data are entered onto EpiInfo 6.0 software for analysis. Sixteen of fifty-seven surveys (28%) were completed and returned to EEP. Five surveys were returned by the post office with no forwarding address, and the balance (36) were not returned. A bias in the analysis of data may be present as not all surveys were returned by cases. Additionally, medical records which are extracted do not always contain information for all categories desired.

RESULTS

There were 57 work-related burns reported in Utah during 1998 and one fatality attributed to work-related burns. Two work-related cases were burned to the extent that they are permanently disabled. The incidence rate for work-related burns was significantly higher among males (9.1) than females (1.8). The incidence for both males and females was 5.4 per 100,000 (workforce) population in Utah. Of the 57 work-related burns reported, males accounted for 82 percent of the injuries in contrast to females who accounted for 18 percent of the injuries (Table 1, Appendix).

Relative to age groups, workers who were 25 - 44 years of age accounted for 51 percent of all work-related burns (Table 2). Five percent of the work-related burns occurred among workers less than 19 years of age.

Relative to counties, 61 percent of all the work-related burns occurred in Salt Lake County. The counties demonstrating the next highest percent occurrence of work-related burns include Utah (8.7%), Weber (7.0%), and Tooele (5.2%) counties (Table 3). Salt Lake County accounted for 44 percent of Utah's workforce population, while 25% of the workforce population was accounted for in Utah (15.0%), Tooele (1.1%) and Weber (9.1%) counties (Table 4). The remaining counties accounted for 18 percent of the work-related burn injuries and 30 percent of the workforce population, respectively.

Results of data collected in 1998 also indicate that the highest percentage (29%) of work-related burns occurred in Eating Places (SIC code 5812). The majority of cases were related to contact with hot food or beverage, or contact with the equipment used to cook food and/or beverages. Eight of sixteen, or 50% of these cases occurred to those 25 years of age or younger. Nineteen percent of the burns (SIC code 5812) occurred to those 21 and younger. The second highest percent of work-related burns (7.3%) occurred in the Smelting and Refining Industry (SIC 3339). Four other industries including Steel Works (SIC 3312), Electrical Services (SIC 4911), Building Cleaning & Maintenance (SIC 7349), and Medical & Surgical Hospitals (SIC 8062) accounted for 3.6% each of the work-related burns reported. The remaining work-related burns occurred in twenty-seven different industries.

Ninety-three percent of those surveyed indicated that they were employed full-time when burned. Seven percent were part-time employees. Eight percent reported that they rarely or never before had performed the task associated with the injury, while 50% reported that they performed the task associated with the injury on a daily basis. December was the month most

likely for a work-related burn to occur (19%), and Monday and Saturday were the most likely days (21% each). Sixty percent of the reported work-related burns occurred between the hours of 7:00 a.m. and 3:00 p.m., the traditional day shift. Forty percent of the work-related burn cases occurred to those who had completed high school only, as compared to 13% who had completed high school and went on to graduate from college. Sixty-seven percent of the work-related burns were from a thermal source, 23 percent were from a chemical source, and ten percent were from an electrical source. Most accidents involved only one person (85%) and occurred inside a building (75%). Eighty-three percent of the cases reported that in their opinion, the burn accident could have been prevented, and 64% stated that they were aware of a written set of safety rules provided by the employer (See Case Questionnaire Summary Report in Appendix).

DISCUSSION

Surveillance of work-related injuries involves the enumeration, description and determinants of injuries in workplace populations. Surveillance is the scientific basis for prevention. Successful surveillance strategies depend on consistent case definitions and ascertainment strategies as well as standardized and comprehensive reporting mechanisms (Peek-Asa, Schaffer, et al, 1998). Without accurate and comprehensive case ascertainment, surveillance will underestimate the true number of events, which may lead to misidentification of high risk areas and activities associated with work-related burns.

Burn injuries represent a major complaint for patients presenting to emergency rooms in the US, with over a million visits annually. While the majority of burn injuries are not life-threatening, major burns have a significant risk of mortality and morbidity. Less significant burns still carry a real risk of scar formation and compromise of function. Appropriate intervention activities to reduce the number of work-related burns can reduce untold mental and physical trauma to Utah workers by reducing the number of work-related burn injuries.

Work-related burns can be divided into three causal categories: Thermal, chemical, and electrical. Thermal burns are caused by contact with hot objects, flames, or steam. Chemical burns are caused by contact with acids or bases. Most acids produce a coagulation necrosis by denaturing proteins, and forming an eschar that limits the penetration of the acid. Bases typically produce a more severe injury known as liquification necrosis which does not limit tissue penetration. Electrical burns are infrequent, but can cause major damage. Electrons flowing abnormally through the body of a person produce injury and/or death by depolarizing muscles and nerves, by initiating abnormal electrical rhythms in the heart and brain, and by producing electrical burns by heating and by poration of the cellular membranes. The skin is the largest organ of the body and serves multiple functions essential to the survival of the organism. It plays a major role in thermal regulation and prevents fluid loss from evaporation. It is a hermetic barrier against infection and contains many of the sensory receptors that provide the nervous system with information about the environment. In case of a major burn, these functions are compromised. In Utah, 67% of the burns reported to the work-related burn surveillance program were thermally

caused, 23% were caused by contact with a chemical, and 10% were caused by contact with an electrical source.

This statewide surveillance project is the only system in Utah dedicated to collecting data and tracking injuries associated with work-related burns. The intent of this project is to develop a registry of work-related burn cases in Utah and to use the information from cases to develop and implement intervention activities. These activities would include education and consultation to employers where burn hazards are present, education for work-related cases and workers in general, and broader industry-wide studies and research. Survey results returned to the Utah Department of Health from work-related burn cases indicate that 83% of the accidents were preventable in the opinion of the injured person, and 50% of those burned performed the task related to the burn daily, and eight percent had never before performed the task. These statistics indicate that there is a need for focused work-related burn intervention strategy in the state.

Work-related burns are a leading cause of occupational injury in the United States. A substantial proportion of these burns occur among restaurant workers. Results of data collected by the Utah work-related burn surveillance project in 1998 indicate that the highest percent (29%) of work-related burns in Utah occurred in Eating Places (SIC code 5812). The majority of cases were related to contact with hot food or beverage, or contact with the equipment used to cook food and/or beverages. As indicated by investigations in Colorado and Minnesota (MMWR Sept., 1994) restaurant-related burns, especially those associated with use of deep fryers continue to represent a major and preventable source of occupational burn morbidity, particularly among adolescents. The findings from the Minnesota Adolescent Occupational Injury Study help to define the risk for burn injuries among adolescent workers. As a substantial number of adolescents are employed in the full-service and fast-food restaurant industries, they are at increased risk for sustaining burn injuries. The Utah Work-Related Burn Surveillance Program found that 50% of those burned in Eating Places (SIC code 5812) were 25 years of age or younger, and 19% were 21 and younger.

This evaluation observed that the sex-specific incidence rate for males was over five times the rate of females (Table 1) although U.S. Bureau of Labor statistics indicate that women account for only 45% of the Utah workforce population. Salt Lake County accounted for over two-thirds (61.4%) of all the work-related burn injuries (Table 3). This is primarily attributed to the fact that in 1998, Salt Lake County accounted for 44 percent of the workforce population in Utah (Table 4) (UDOWS, 1998).

The Utah Work-related burn surveillance program has established a reporting system for obtaining work-related burn injury data through the reporting of hospital discharge information to UDOH. Hospitals report to UDOH on a quarterly basis as indicated by the Utah Department of Health's *Injury Reporting Rule*. Additionally, UDOH disseminates surveillance data through written articles in Epidemiology Newsletter, compiling statistical reports to provide to local and state health officials in Utah and other interested parties, and also providing educational pamphlets to target industries. UDOH also has established a dialogue with officials at NIOSH and the Injury Prevention and Research Center at the University of Kentucky to standardize protocols, data

management systems, and questionnaires.

CONCLUSION

During 1998, the Work-Related Burn Surveillance Program collected information on 57 work related burn injuries out of a total of 270 burns reported through hospital discharge reports. Analysis of the burn data suggests that there is a need for a focused work-related burn prevention program as 82% of those injured suggest that the burn accident could have been prevented, and 50% indicate that they were injured performing a task on which they work daily.

One of the goals of the Work-Related Burn Surveillance Program is to identify high risk populations in the State of Utah, and to develop intervention strategies to reduce the number and frequency of work-related burns. From the data collected in 1997 and 1998, certain high risk industries are emerging as prime candidates for targeted intervention activities. However, more data are needed to identify with certainty the high risk work-force populations that would be appropriate for Utah. Continued surveillance of work-related burns is needed to develop appropriate intervention strategies for Utah and local health departments.

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APPENDIX

Table1. Crude incidence rates of work-related burn cases, total number of work-related burns, total number of burns, and percent of total number of work-related burns in Utah by sex during 1998.

BURN INJURIES IN UTAH BY SEX, 1998				
SEX	**†INCIDENCE OF WORK-RELATED BURNS**	**TOTAL NUMBER OF WORK-RELATED BURNS**	**TOTAL NUMBER OF BURNS**	**% OF BURNS THAT ARE WORK-RELATED**
FEMALE	1.8	10	107	18
MALE	9.1	47	163	82
BOTH SEXES	5.4	57	270	100

†Crude incidence rates are calculated per 100,000 population based on Utah's 1998 *total workforce* population.
Data Source: Burn injury data was obtained from the Utah Department of Health's, Bureau of Epidemiology from Databases of Hospital Admissions and Discharge Data under the authority of the Utah Injury Reporting Rule (R386-703).

Table 2. Crude incidence rates of work-related burn cases, total number of work-related burns, total number of burns, and percent of total number of burns in Utah by age-specific groups during 1998.

BURN INJURIES IN UTAH BY AGE GROUPS, 1998				
1998 AGE GROUP	**†INCIDENCE OF WORK-RELATED BURNS**	**TOTAL NUMBER OF WORK-RELATED BURNS**	**TOTAL NUMBER OF BURNS**	**PERCENT OF BURNS THAT WERE WORK-RELATED**
0 - 14	0	0	60	0
15 - 19	2.6	3	16	5.3
20 - 24	8.0	11	24	19.2
25 - 34	6.6	14	44	24.5
35 - 44	6.7	15	40	26.3
45 - 54	7.5	12	29	21.1
55 - 64	1.2	1	15	1.8
65 +	0.8	1	42	1.8
All Groups	5.4	57	270	100.0

†Age-specific crude incidence rates are calculated per 100,000 population based on Utah's age-specific *total workforce* population for 1998.

Data Source: Burn injury data was obtained from the Utah Department of Health's, Bureau of Epidemiology from Databases of Hospital Admissions and Discharge Data under the authority of the Utah Injury Reporting Rule (R386-703).

Table 3. Crude incidence rates of work-related burn injury cases, total number of work-related burns, total number of burns, and percent of total number of burns in Utah by county during 1998.

BURN INJURIES IN UTAH BY COUNTY, 1998

COUNTY	†Incidence of WRB	Number of WRB	Total Number of Burns	% of Burns That are Work-Related	COUNTY	†Incidence of WRB	Number of WRB	Total Number of Burns	% of Burns That Are Work-Related
Beaver	0.0	0	0	0.0	Piute	0.0	0	0	0.0
Box Elder	11.3	2	5	3.5	Rich	0.0	0	0	0.0
Cache	0.0	0	4	0.0	Salt Lake	7.7	35	145	61.4
Carbon	0.0	0	0	0.0	San Juan	22.9	1	1	1.8
Daggett	0.0	0	0	0.0	Sanpete	0.0	0	2	0.0
Davis	1.8	2	21	3.5	Sevier	0.0	0	1	0.0
Duchesne	36.4	2	3	3.5	Summit	0.0	0	1	0.0
Emery	0.0	0	0	0.0	Tooele	27.1	3	6	5.2
Garfield	41.2	1	2	1.8	Uintah	0.0	0	2	0.0
Grand	0.0	0	2	0.0	Utah	3.3	5	32	8.7
Iron	7.3	1	6	1.8	Wasatch	0.0	0	2	0.0
Juab	0.0	0	1	0.0	Wash.	2.9	1	8	1.8
Kane	0.0	0	0	0.0	Wayne	0.0	0	0	0.0
Millard	0.0	0	3	0.0	Weber	4.3	4	23	7.0
Morgan	0.0	0	0	0.0	State of Utah	5.4	57	270	100.0

†Crude incidence rates are calculated per 100,000 population based on specific county's 1998 *total workforce* population.

Data Source: Burn injury data was obtained from the Utah Department of Health's, Bureau of Epidemiology from Databases of Hospital Admissions and Discharge Data under the authority of the Utah Injury Reporting Rule (R386-

703). WRB - Work-Related Burns

Table 4. Incidence of work-related burns, total number of workforce population, and percent of state workforce in Utah by county during 1998.

WORKFORCE IN UTAH BY COUNTY, 1998							
COUNTY	**†Incidence of WRB**	**Total Number of Workforce**	**Percent of State Workforce**	**COUNTY**	**†Incidence of WRB**	**Total Number of Workforce**	**Percent of State Workforce**
Beaver	0.0	2,282	0.2	Piute	0.0	486	0.05
Box Elder	11.3	17,734	1.7	Rich	0.0	916	0.09
Cache	0.0	41,795	4.1	Salt Lake	7.7	453,458	44.3
Carbon	0.0	9,010	0.9	San Juan	22.9	4,375	0.4
Daggett	0.0	388	0.04	Sanpete	0.0	8,223	0.8
Davis	1.8	110,252	10.8	Sevier	0.0	7,636	0.7
Duchesne	36.4	5,492	0.5	Summit	0.0	13,081	1.3
Emery	0.0	3,767	0.4	Tooele	27.1	11,074	1.1
Garfield	41.2	2,425	0.2	Uintah	0.0	9,820	1.0
Grand	0.0	4,689	0.5	Utah	3.3	153,702	15.0
Iron	7.3	13,642	1.3	Wasatch	0.0	5,710	0.6
Juab	0.0	3,348	0.3	Wash.	2.9	34,729	3.4
Kane	0.0	2,368	0.2	Wayne	0.0	1,371	0.1
Millard	0.0	4,309	0.4	Weber	4.3	93,265	9.1
Morgan	0.0	3,454	0.3	State of Utah	5.4	1,022,801	100.0

†Crude incidence rates for counties are calculated per 100,000 population based on Utah's 1998 *total workforce* population.

Data Source: Burn injury data was obtained from the Utah Department of Health's, Bureau of Epidemiology from Databases of Hospital Admissions and Discharge Data under the authority of the Utah Injury Reporting Rule (R386-703). Workforce population was obtained from the Utah Department of Workforce Services, Division of Workforce Information and Payment Services for 1998.

WRB - Work-Related Burns

CASE QUESTIONNAIRE SUMMARY REPORT

Industries of employment of work-related burn cases :

Commercial Printing	Chemical Manufacturing	Metals Manuf.	Trucking
Electrical Power	Airplane Manufacturing	Industrial Machinery	Restaurant
Food Processing	Steel Mill	Hospital	Forest Service
Mining	Public Golf Course	Natural Gas Service	Oil Refining
Refining	University	Construction	Welding
Electronics	Waste Disposal	Food Service	Brewery

Employment Status:

Full Time: 93% Part Time: 7%

Length of Time in Occupation:

Range 10 to 264 months, with a mean of 10.1 years

Length of Time at Position:

Range 5 to 262 months, with a mean of 5.9 years

Frequency of Performing Task Associated with Injury:

Daily for most of the day:	50%
Once weekly:	14%
Periodically:	28%
Rare, or never before:	8%

Demographics of Work-Related Burn Cases:

Age range of 18 to 72 years, with a mean of 36 years

Male:	82%
Female:	18%

Education:

Some high school:	7%
High school graduate:	40%
Two years of college:	40%
College graduate:	13%

Language:

All English speaking

Hospitalization Time:

Range of 0 to 51 days with a mean of 9.9 days

Days of Work Missed:

Range of 0 to permanently
One fatality, Two cases injured permanently
Average 22.9 days for those hospitalized

Burn Injury Accident

Burn injury could have been prevented (opinion of victim):

Yes: 83% No: 17%

Burn injury occurred as the result of inadequate equipment:

Yes: 34% No: 66%

Employee was aware of written set of safety rules:

Yes: 64% No: 36%

Employer provides personal safety equipment for employees:

Yes: 86% No: 14%

Employer conducts safety training sessions for employees:

Yes: 79% No: 21%.

Frequency of safety training sessions:

Infrequent or irregular:	36%
Weekly:	14%
Monthly:	14%
Biannually:	14%
None:	22%

Location of burn injury event:

Outside of enclosure:	25%
Inside of enclosure:	75%

Day of week of occurrence:

Sunday:	7%
Monday:	21%
Tuesday:	14%
Wednesday:	7%
Thursday:	16%
Friday:	14%
Saturday:	21%

Time of day of occurrence (Ranging from 1:50 A.M. to 8:30 P.M.)

Day shift (7-3:00):	60%
Swing Shift (3-11):	33%
Graveyard Shift (11-7):	7%

Month of the Year

January	11%	May	11%	September	7%
February	1%	June	9%	October	7%
March	7%	July	7%	November	1%
April	13%	August	7%	December	19%

Number of workers injured per incident:

1-85% of time
More than 1-15% of the time

Source of Burns

67%	Thermal Source
23%	Chemical Source
10%	Electrical Source

Degree of Work-related Burns

1st Degree Burn	9%
2nd Degree Burn	67%
3rd Degree Burn	24%

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